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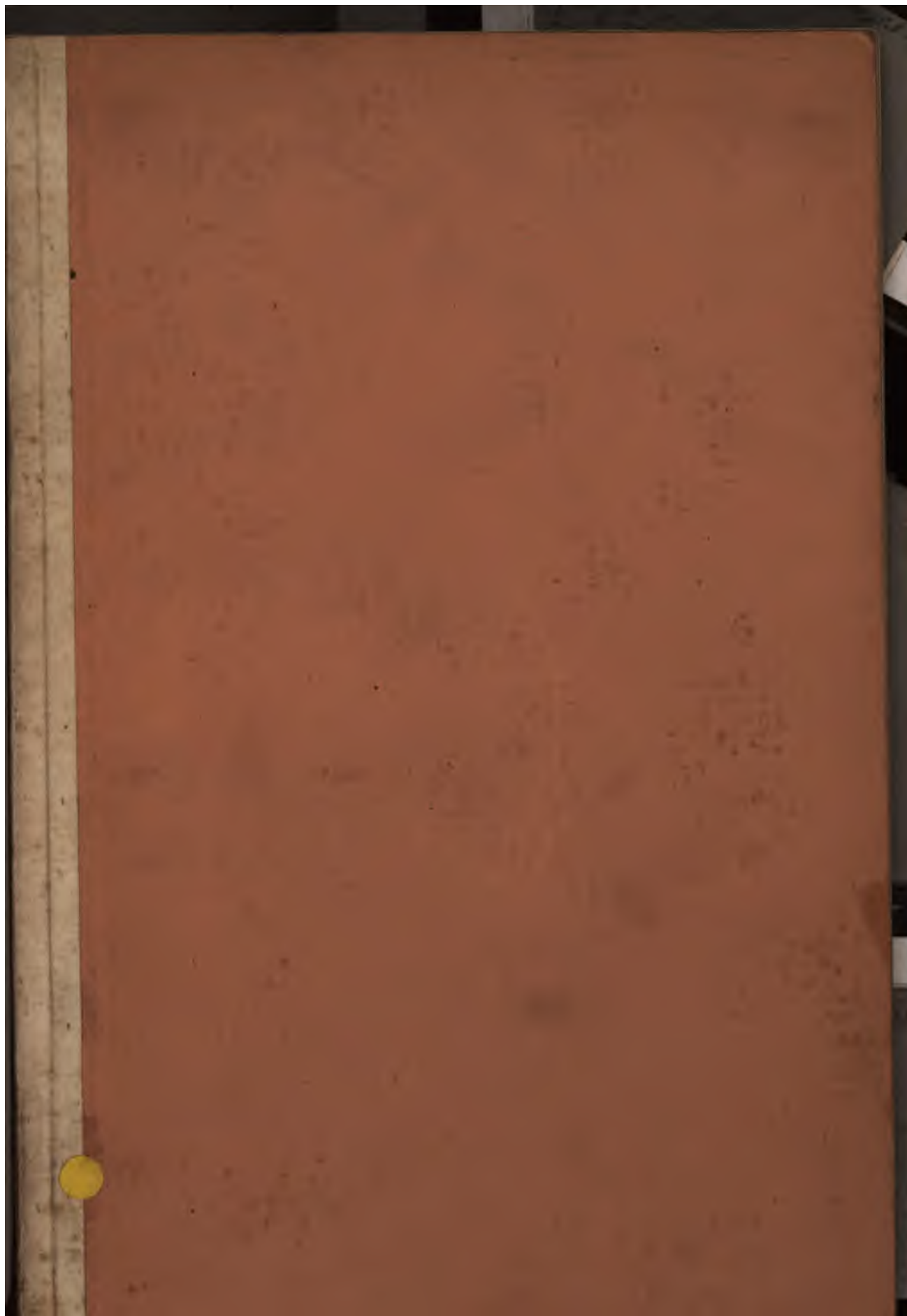
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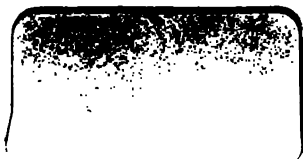
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THE INTERNATIONAL HEALTH EXHIBITION:

ITS INFLUENCE AND POSSIBLE SEQUELS.

BY

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A PAPER READ BEFORE THE SOCIETY OF ARTS, NOVEMBER 26, 1884,

THE DUKE OF BUCKINGHAM AND CHANDOS, G.C.S.I., IN THE CHAIR.



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THE INTERNATIONAL HEALTH EXHIBITION:

ITS INFLUENCE AND POSSIBLE SEQUELS.

BY ERNEST HART.

Reprinted from the "Journal of the Society of Arts," November 28, 1884.

In undertaking, at the request of the Council of the Society of Arts, to deliver at very short notice an address on the subject of the International Health Exhibition, I am influenced far less by any sense of personal fitness for undertaking a duty which would certainly be better filled by many of the eminent persons connected with that important and successful enterprise, than by a desire to carry out the wishes of the authorities of a Society which has from the first so largely aided in the successful development of the work of the Exhibition, and in the completeness of some of the most important of its executive details, and on which there may possibly devolve important duties in connection with the more permanent memorials which that undertaking may be expected to leave behind it. The members of the Society of Arts will inherit from the International Health Exhibition one legacy at least, upon which, indeed, they have already entered, which will constitute one of the most lasting memorials of the Exhibition, and one which is destined to exercise a far reaching influence in the furtherance of popular knowledge on health subjects and the encouragement of further progress. I refer to the twenty solid volumes of handbooks, lectures, conferences, and

catalogues which constitute the literature of the Exhibition. In their subject-matter they are of unsurpassed excellence, and the more they are studied, the more they will be appreciated.

Health exhibitions belong altogether to quite modern history, as, indeed, it is inevitable that they should, seeing that the science and art of sanitation, as we now study it, is of altogether modern origin, and may be said to be of chiefly English growth. Putting aside any attempt to review the history of health exhibitions in this country, I may say that I believe that the earliest attempts in that direction may be justly set down to the credit of the Social Science Association, which has, during many years, held local exhibitions of the kind in connection with its annual meetings. This association held its first exhibition in connection with its annual congress in Leeds, in 1871, followed by exhibitions in Norwich in 1873; Glasgow, 1874; Brighton, 1875; Liverpool, 1876. The Sanitary Institute held its first exhibition in 1879, and has since continued them in various great cities. The Parkes Museum, established in 1876, has since continuously developed the valuable collection formed in memory of eminent man whose name it bears, 1

successfully endeavoured, from year to year, to make this institution of increasing use by a series of lectures and meetings, which should attract to the museum persons interested, or whom it was desired to interest, in public health questions. These conferences afford an opportunity for diffusing information and for obtaining and communicating exact information on subjects relating to the public health. An exhibition of sanitary appliances, and of medical and surgical instruments related thereto, was successfully arranged by the authorities of the Parkes Museum at South Kensington in the year of the Medical Congress, 1881. So far as I know, however, the first health exhibition held in this metropolis, in the sense in which that word has been understood on this occasion, viz., health in its relation to the habitation, food, and dress, was organised by a sister society, the National Health Society, in 1883, in a large iron building at Knightsbridge, since known as Humphrey's hall. A special exhibition, with the object of promoting the Abatement of Smoke, was held at South Kensington in the year 1881, by the Smoke Abatement Committee, and had a valuable influence on public opinion, and in stimulating the ingenuity of inventors in a direction in which improvement is much needed.

The present Exhibition was organised under circumstances of some difficulty, owing to the great pressure of time, and the difficulties which the short space of time at command interposed in the way of making the display as fully international and representative as might have been desired. My first communications with Sir Philip Cunliffe-Owen on this subject were made early in July of last year, and I have before me a very complete programme, closely corresponding to that of the present Exhibition, which, with his approval, and the valuable assistance of Mr. Redgrave, was then drawn up, after an examination of the classifications, lists, and catalogues belonging to all previous exhibitions of the kind in this and other countries. At that time, however, there was reason to believe that the buildings of the International Fisheries Exhibition would be occupied by a display of another kind, and the preliminary steps then taken, therefore, fell into abeyance. In October of 1883 (at the close of the Fisheries Exhibition) his Royal Highness, the Prince of Wales, announced his intention of organising a Health Exhibition in the buildings which had been the seat of the successful Fisheries Exhibition of 1883, in the following terms :—

"I have expressed a desire that the Exhibition of 1884 will embrace the conditions of health, in so far as, like food, clothes, and dwellings, they fall under the head of hygiene, or, like appliances for general and technical teaching, gymnasia and schools, under that of education."

These comprehensive words correspond closely and singularly with the definition which the late Dr. Parkes gave of the word hygiene :— "Hygiene signifies perfect rules for mind and body; it is impossible to disassociate the two."

The Saxon word "health" was chosen in planning the Exhibition, in lieu of the new scientific word "hygiene," for reasons which need no explanation, as being at once English and popular; on the other hand, the use of a phrase so popular, and to which a special domestic meaning has long attached, has made it easy for the numerous critics who are always at hand to correct us in our phraseology and in our acts, to achieve a superficial triumph in reviewing the numerous departments of the Exhibition by asking— "What has this or that particular exhibit to do with health?" The answer was, of course, easier than they chose to assume. Had the more technical and scientifically applicable word of hygiene been adopted, it would perhaps not have been so easy to the most captious critic to ask what have food or dress, or any element of the construction or fittings of the dwelling, to do with hygiene; for just as sanitation is a modern science, so is hygiene a modern word, which most briefly summarises the scope of modern sanitary endeavour. A Health Exhibition it was, in so far as health may be accepted as the synonym of "hygiene."

I shall not fatigue you by a recapitulation of the departments, or an analysis of the classification. The heads under which the various exhibits were shown may be summarised as food, dress, the dwelling, its construction, and fittings; water supply and sanitation, heating, lighting, and ventilation; the ambulance, the workshop, the school, and technical education.

The programme of the International Health Exhibition was properly, and even necessarily, so wide, that to attempt to deal with any considerable proportion of it in detail, in the short space of time to which a paper such as this is rightly limited, would reduce the character of any observations which could be made to that of a mere synopsis which would

have much of the character of a catalogue, and would therefore be foreign to the objects we set before us in a meeting such as this. I think that I shall be making the most useful employment open to me of the time at command this evening, if I limit our consideration to-night, of the Exhibition which has just closed, to a small and selected number of topics, among those—and they are many in number—which the Exhibition seems to me to suggest in respect to the consideration of its past usefulness. Especially also I wish to refer to the useful sequences which may practically result from it in various directions, by the active impressions which it made upon a number of the scattered organisations in this country possessing health functions, and upon the great body of the people, to whom we must look for support in the departments of sanitary progress which the Exhibition revealed to us as being in most pressing need of practical development.

EXECUTIVE COUNCIL AND COMMITTEES.

Before passing, however, to consider those particular features in the Exhibition from which, it seems to me, its useful influences have resulted, and will in the future flow, I think you will agree with me that it is not unfitting that I should give some idea of the nature of the organisation by which so great a result was effected, and of the work done in the different departments. I shall neither affect nor attempt to give this in complete detail. The Official Report which the Duke of Buckingham, the Chairman of the Executive Council, is engaged in preparing, and will shortly present to his Royal Highness the President, will no doubt set out, with accuracy and completeness, the chief facts connected with the working of the organisation over which his Grace has presided with such indefatigable assiduity, comprehensive knowledge, and singular attention to business detail.

You will, I am sure, however, think it right that I should remind you that immediately on their appointment, the Executive Council lost no time in organising a series of sub-committees and divisional sub-committees—seventeen in number, and including persons best known for their thorough information in each of the classes represented in the Exhibition. These sub-committees drew up a series of memoranda for the guidance of exhibitors, which are in themselves highly interesting and valuable documents, and will continue

to have a permanent value for the guidance of all who may undertake a similar enterprise in the future. These memoranda are to be found prefixed to all the editions of the catalogue, and tend to make that catalogue what it will long continue to be, an almost indispensable work of reference to whoever would have at hand a classified list of the objects which at the present time illustrate in the best manner our most advanced knowledge of applied sanitation in all its departments. The Executive Council met continuously, at least twice a week, for a long series of months, and with the invaluable aid of the sub-committees, and of the well-trained, able, and zealous executive staff placed at their disposal, they succeeded, in a short space of time, in making all the necessary arrangements.

FOREIGN CONTRIBUTIONS.

With foreign countries it was difficult, within the limited space of time at disposal, to make the necessary communications, and to convey the information they required, in order to induce them to take an active part in the Exhibition. In this object also an unexpected success was attained. Distant countries, such as China, were communicated with by telegraph, and—thanks, in a great measure, to the singular energy and goodwill of Sir Robert Hart, Mr. Campbell, and the Chinese Commissioners of Customs, and to the courageous initiative of Sir Philip Cunliffe-Owen—China undertook and carried out an exhibit of unique interest, in respect to a practical display of its food resources and culinary peculiarities, as well as of much that was picturesque, if not of scientific moment, in relation to the dwellings and the clothing of that most interesting nation. Thanks also to the active intelligence and courtesy of the Japanese Minister, Mr. Mori, the Japanese Government became, at a somewhat late date, warmly interested in the objects of the Exhibition, and they furnished a display of quite unsurpassed interest both in all that relates to scientific sanitation, in which this remarkable nation has made astonishing progress, and in respect to the illustration of the dwelling, clothing, and domestic arrangements of the people, as well as to the development of decorative art in its relation to the house. The Japanese Commissioners, Mr. Nagai, Mr. Tegima, and Mr. Murai, were, from the moment of their arrival in this country, quite indefatigable, and singularly successful in their endeavours to make the unique display which the Japanese Govern-

ment so liberally forwarded to this country thoroughly intelligible and profoundly interesting to all the visitors to the Exhibition. To this remarkable liberality and ability with which the Chinese and the Japanese Governments despatched and organised their contributions to the International Health Exhibition, was due one of its most attractive and novel features. Nothing had ever before been seen in Europe which could convey with so much picturesque accuracy, a correct idea of the food, clothing, sanitation, and educational arrangements of these two great Asiatic nations as that which was seen in this Exhibition, in the Chinese and Japanese courts, and the restaurants attached to them. The special catalogues, published by the Commissioners, are in themselves contributions of unique interest to the literature of the subjects illustrated by the Exhibition. Those who do not possess them, or who have not studied them in relation to the exhibits displayed, have lost an opportunity never before afforded, and which can hardly again recur, of obtaining an insight into the intimate life of these distant and marvellously organised countries, such as everyone not destitute of an ordinarily intelligent curiosity must desire to possess, and must have felt infinite pleasure in acquiring. If I may be allowed to say a word for that nation, for which I feel a peculiar and almost affectionate admiration, I would say that the history of the world shows nothing which can compare in kind with the rapidity with which the Japanese people have mastered the principles and practice of scientific sanitation; or with the unexampled capacity which they have shown for rapidly appreciating, and accurately applying to the conditions of their own country the results of European science and European practice in all that relates to public health and to the sanitation of the house. Those who have studied the reports of the sanitary and meteorological bureaux which were shown in this exhibit, will know that I am not exaggerating when I say that at the present moment Japan includes among its native citizens many persons who are to a great extent, and on a great variety of the most difficult questions of hygiene, as thoroughly informed and as soundly inspired with the principles and practice of hygienic science as any of our most advanced European professors. Of course, the whole resources of civilisation have not been equally applied to all parts of Japan, and there are still to be found there the most remarkable contrasts of an ancient Asiatic civilisation in immediate con-

tact with the last results of European scientific knowledge and practice. The centres of government are, however, evidently penetrated with a strong sense of the importance of extending throughout the whole empire of Japan those principles which are so well understood at the centre. It was with great satisfaction that the Executive Council received, near the close of the Exhibition, from the Japanese Commissioners the expression of their desire that the Council should furnish them with a report, by an expert, upon the ordinary dietary and dietetic materials which constitute the staple of the daily food of the population of Japan. With this request they were happy to comply, and Professor De Chaumont has undertaken to furnish the required report. Meantime, with characteristic industry and practical sense, the Japanese Commissioners have studied for themselves the exhibits of other nations in the Exhibition, and have effected exchanges which will on the one hand enrich one of the European nations—not, I am sorry to say, our own—with many of the most characteristic of the Japanese exhibits, and, on the other hand, will transfer to Japan the corresponding exhibits of the Austrian Government.

In regard to other foreign nations, I shall pass lightly over the brilliant display of Siam, which arrived late, and for which we are much indebted to the influence of Mr. Satow, our recently appointed minister in that country, whose unrivalled erudition and intimate acquaintance with Eastern literature and customs give to all his work a special *cachet* of learning and distinction, which have made his name known in every country where European scholars study Eastern customs with anything like seriousness or depth of research. Of that display we have reason to hope that some of the most interesting parts will, by the liberality of the Siamese Government, be secured for public use.

Among the European countries, the display made by France held naturally and justly a most prominent position. It was not until January that any movement was made by the French Government to assist in carrying out the wishes of the Executive, or in reference to communications made through the Foreign Office. For the remarkable completeness of the French display we are indebted largely to the active assistance of the authorities of the Société de Médecine Publique in Paris, who aided me greatly by their vigorous representations to the Ministry of Commerce and of Public Instruction (when I visited Paris for the purpose

in January), as to the great importance that France should take a suitable part in this Exhibition; but it is doubtful whether such representations would have been effective but for the subsequent presence of Sir Philip Cunliffe-Owen in Paris, and the activity which his great personal influence there was able to give to the preparations then commenced. Although late in beginning, the French display lost nothing, thanks to the liberality of the grant made by the French Government, and the skill and energy of the eminent persons who were nominated by the Ministers and by the Prefect of the Seine, to form a French Commission. Dr. A. J. Martin, Commissaire-General, devoted himself, at great personal sacrifice, to the arrangement of the numerous exhibits of France in a thoroughly scientific order. It is impossible that I should do more than refer to the principal elements of interest in the highly instructive and scientific section which was filled by the Ville de Paris, and by the public institutions of France, but no section in the whole Exhibition was more worthy—none, I will venture to say, so well worthy—of careful study as the display of France. I omit at the moment any detailed reference to that which was the gem of the whole collection, viz., the display of M. Pasteur, because I shall have occasion presently to refer to it in further detail.

Italy, which up to the month of February had remained unmoved by the official representations transmitted through the Foreign Office, was, however, induced by the personal intervention of his Majesty the King of Italy, and the liberal and patriotic action of the municipality of Rome, led by the Duke Tortona and the Marchese Vitelleschi, to enter actively into the spirit of this great display. I had the honour of an interview with the King in the month of February, together with Mr. Harold Acton, who was sent out by the authorities at South Kensington with the purpose of assisting me in awakening interest in the objects of the Exhibition in Italy, when the King entered very fully into the details of all that was required, and authorised a public statement of his personal interest in the undertaking, and his desire that Italy should fully participate in the valuable enterprise which his Royal Highness the Prince of Wales had organised. This public declaration of the wishes of the King, who takes the most lively personal interest in all the affairs of his country, and enters minutely into the business of public offices, was of immense service in facilitating our subsequent proceedings with

the public ministries. No one who entered the Italian Court but must have been struck with the profoundly interesting display of the works of sanitation belonging to the old Roman period. The arrangements for baths, for water supply, and for drainage, in the ancient city of Rome, put to shame those of our modern London, or, indeed, of any modern European city, and form a model on which Rome and its municipality are endeavouring once more to reform their public water supply and drainage. Rome has greatly benefited within the last ten years by the spirit of modern sanitary science; the water supply of Rome, its drainage, the sanitation of the surrounding country, the construction of its public buildings and institutions, the provision of ambulance arrangements for the sick, all offer features of very great interest. These were illustrated by many most interesting models, plans, and designs, and I am glad to say that many of these will probably remain in this country. The food resources of Italy, and its great and growing power of adding to the dietary of the table of our own country and of other European countries, was well exemplified in this court by the exhibits of the *Circolo Ænofilo*, to whom that country is largely indebted for the development of its exportation, as well as by private exhibitors. I do not think we can express too warmly our satisfaction at the valuable contribution which Italy made to this Exhibition. I am sure that Englishmen feel a peculiar pleasure in witnessing the marvellous growth of commercial energy and scientific education in united Italy. Their wines, of which enormous quantities are at the present moment imported into France and other wine-growing countries, for the purpose of mingling with their vintages, and of being re-exported to us under names well established in our markets, have a character of genuineness and special merits of their own, which only require to be better known in this country in order to assume their rightful place in public favour. One result to which we may look forward in connection with this Exhibition, is a large increase in popular acquaintance with the merits of the Italian food supplies, her cereals, her pastes, and her wines. Certainly such a result is well deserved, from their intrinsic worth, as well as from the public spirit with which the principal chambers of commerce and public bodies, as well as individuals, responded, under great pressure of time and no small public sacrifice, to the appeal which reached them at a very early date. The

contribution of Italy to the Exhibition was one of its greatest and most genuine attractions.

Belgium early, if not, indeed, first, among European nations, demonstrated that enlightened interest in sanitation with which she has for some years been rightly credited, by applying for a considerable amount of space, which she worthily filled. There is no one who is acquainted with the history of some of the most important questions of public health, who does not know that the City of Brussels offers in many respects a model which we and all other European countries would do well to follow. Under the direction of Dr. Jansens, a central bureau of hygiene in Brussels is so arranged that every case of infectious disease is immediately notified to him, the circumstances which call for public intervention or which make it unnecessary being at the same time stated. Every such case is at once pricked off on maps with coloured pins, so that he is enabled to follow the march of infectious disease just as a general the march of his troops. To Belgium, also, we owe chiefly that practical experience, and that scientific study of vaccination direct from the calf, which has enabled us to determine means by which the objections which some persons entertain to vaccination from arm to arm may be avoided. It was to Brussels I found I had to go, now four years since, when I wished to study this subject, with the view of inducing our Government to introduce vaccination from the calf as a State institution in this country, a result which has since followed. It was from Brussels that we invited Dr. Warlomont to come to London, to give us the result of his Belgian experience, and to the information thus gained, and to the experience acquired in Belgium, we mainly owe it that we have now established in this country a system of vaccination direct from the calf as part of our public institutions. We are thus under a debt of no small magnitude to these enlightened sanitary administrators. All those elements for guarding health and the protection of infant life, for the sanitation of factories, for the education of the deaf and dumb and blind, which the Exhibition was designed to bring into prominence, were illustrated in the Belgian Court in a manner which could not fail to be profoundly instructive to those who sought for serious studies in this Exhibition.

To the other exhibits it is impossible for me to refer, seeing the very restricted canvas on which alone I can allow myself to night to sketch. The able and extended

survey which Sir Frederick Abel took last week, in his opening address, of many of the departments of the Exhibition, his study of the more important conferences and lectures which were given, will dispense me from the necessity of referring to a great variety of topics which could not properly be excluded from any paper, however condensed, or however limited, treating of the Exhibition. They have already been referred to with so extended and so discriminating appreciation by our eminent chairman, that I shall say but little of the general aspects of our English display. I cannot, however, refrain from joining with him in a tribute to the remarkable interest of that picturesque range of buildings illustrating the habitations, the technical education of Old London, which we owed to the liberality of the Corporation and to the City Guilds, and the untiring energy of Mr. Shaw, who, as Chairman of the City Committee, devoted himself with unceasing labour to the development of an idea which he was one of the first to accept, and which he carried out with the aid of Mr. Birch, Mr. Gardner, and others, with a completeness and a rapidity which astonished everyone. Nor is it possible to omit the reference once more to that complete and brilliant display by the water companies, under the superintendence of Sir Francis Bolton, which, whether in its purely hygienic aspect as affording a survey of the enormous organisation by which London is supplied with water, or in its holiday character, as seen at night in the illuminated fountains, was the talk of London throughout the season, and drew crowds to the building.

LONDON WATER COMPANIES.

The metropolitan water companies appeared in a new light at this Exhibition, and entered the arena as caterers for the pleasure, amusement, and instruction of the public. Candour compels us to admit that they succeeded most admirably, thanks, in a great measure no doubt, to the able supervision and energetic initiation of Colonel Sir Francis Bolton, with whom, and Sir Philip Cunliffe-Owen, the idea of having a waterworks exhibit originated. The proposal was no sooner made than acted upon, and H.R.H. the Prince of Wales received, in answer to a letter written by him to the various water companies, the most hearty assurances of co-operation from the companies.

A sub-committee was then appointed, under Sir Francis Bolton, consisting of Professors De

Chaumont and Frankland, Brigade-Surgeon Dow, Mr. Michael, Q.C., Mr. S. H. Louttit, Mr. Philip A. Scratchley, Mr. A. T. Simpson, C.E., Dr. T. Stevenson, Mr. J. Taylor, C.E., and Col. Webber, R.E., C.B.; and to this body the engineers of the respective companies were subsequently added. As explained in the letter of His Royal Highness, the exhibit embraced all that related to the sources, collection, and filtration of the London water supply, together with house storage, economy and waste of water, and its uses for every domestic purpose.

The principal portion of the display found an abode in a building constructed in the form of a regular octagon, with an annexe adjacent to the Prince of Wales' Pavilion. The difficulty experienced was to make the specimens and objects exhibited sufficiently attractive; in other words, "to invest them with artistic merit," and the Committee ultimately resolved to decorate the structure, so as to assimilate it as much as possible with the characteristics of the rivers Thames and Lee, and the general sources of the metropolitan supply.

The pavilion was specially constructed for the purpose of this collective exhibit, the object of which was to show the manner in which the inhabitants of London are supplied with water, and to convey to the general public as clear an idea as possible of the magnitude and importance of the metropolitan water supply. The octagonal shape was adopted, in order that each company might have one side of the octagon for its exhibits.

In the outside annexe the special exhibits of each company were shown, and at regular intervals there were specimens of the various large mains used in the metropolis, varying in size from 13 to 48 inches, as well as water meters and hydrants. The number of miles used in the metropolis was painted on each specimen.

In the retiring angle to the south of the door was a specimen of a flexible pipe, as used by the Southwark and Vauxhall Company; and in the retiring angle to the north was a complete section showing a large main as laid in a London street, with all the necessary cocks and appliances. There was also a complete section of a house supplied with fittings in accordance with the requirements of the Act of 1871.

In a garden specially attached to and adjoining the Water Pavilion was a separate building, which contained specimens of various

laboratory apparatus used in making analyses of water by different systems.

In connection with the collective exhibits was a fountain display, beneath the Prince Consort's statue in the garden. An island was constructed in the centre of the basin, on the middle of which was a large jet surrounded by small fountains and aqueous plants. This island served for a subaqueous cabin, in which were placed the aqueous and illuminating apparatus. The whole of the basin was laid out in fountains capable of illumination, and water plants and a border of jets surrounded the basin.

The cascades were also worked at the same time as the fountains, the whole of which were illuminated by electric lights, so as to produce appropriate changes of colour. The principle of this illumination was the fact that a stream of water can be illuminated internally, by causing the jet of water to issue from a hole in the side of a receiver through which a powerful beam of light is thrown from the other side. The light thus struck the internal surface of the jet, and was totally reflected. The effect of this was to keep the light within the jet, which was thus illuminated within throughout its whole course, and in the dark resembled a stream of fire.

Great assistance was given to Sir Francis Bolton by the engineers of the water companies, who acted on the sub-committee for carrying out the arrangements.

Not the least attractive feature of the very attractive exhibit, which reflects the greatest credit, was the collection of old prints and documents associated with the history of the various water companies. Sir Hugh Myddelton was naturally to the front in many ways, but no one could have anticipated that the name of Pepys would in any way be associated with the water question, yet the New River Company exhibited a water-rent receipt for water supplied to the famous diarist in 1706.

FOOD DEPARTMENT: THE QUESTION OF ADULTERATION.

Referring generally to that great bulk of the Exhibition which was occupied by English exhibitors, I would say that, while much reference has been made to the apparently miscellaneous character of many of the exhibits, I know that much care was taken that not one should be admitted which had not an immediate reference to the prescribed programme, and of which the *raison d'être* was not easy to discover. It was perhaps,

however, from one point of view, open to exception that the great central avenue should have been taken up with the food display, in which the commercial interest was mainly predominant, and as to which the scientific importance was only determinable when the work of the juries came into play. By these the relative values of the articles exhibited was subjected to a searching test, such as certainly has never before been applied to the ordinary commercial articles of food publicly offered in this country, and to which it is greatly to the credit of the exhibitors that they willingly submitted. There is only one exhibit in this department to which I would specially call your attention, it was that from the collections of the Science and Art Department and the Parkes Museum, illustrating the constituents of food and food values, and the connected exhibit by the Society of Public Analysts, of materials used as adulterants of articles of food; of adulterated articles of food commonly sold in this country; of adulterations which have been suppressed; of adulterations practised abroad, and mixtures generally protected by labelling. This latter was added in consequence of a suggestion made by the late Mr. Wigner, president of the Society of Analysts, at a late date in the progress of the Exhibition. I am afraid that it did not attract all the attention that it deserved. I trust, however, we shall be able to reserve it for continual public reference. Mr. Wigner, in communicating with me, pointed out that although the Exhibition was most successfully arranged so as to display in a prominent manner all the articles connected with food, yet the public were only shown what is done by the most careful and respectable firms, whose names are a sufficient guarantee that only materials of the highest quality are used in the preparation of the goods which they show.

All who are connected with food produce know how, from time to time, the desire on the part of the consumer for cheap goods is the cause of the introduction of articles called "substitutes," which are offered to the manufacturer at one-third the price of the genuine material, and which frequently consist of some cheap and simple preparation, the very opposite in its chemical character to the article for which is said to be an efficient substitute: several cases of this kind had recently been brought to Mr. Wigner's notice. For instance, he referred to an article to be used as a substitute for tartaric acid, the composition of which has been found

to be acid sulphate of alumina in solution—a substance which, if introduced into the manufacture of bread or biscuits, is as objectionable as alum, and quite as much an adulterant. Bisulphate of potash is also sold under a name similar to tartaric acid, and is equally as worthless as sulphate of alumina. These are only two instances out of many, and serve as an additional argument to show the keen competition in trade, which causes the manufacturer to produce, and unscrupulous firms to sell, such articles under "Royal Letters Patent," or some other heading of this sort, to attract the notice of the consumer.

The public analyst, Mr. Wigner added, although, of course, he should be cognizant of these facts, has quite enough work for the remuneration paid to him, and in addition to this, there is the fact that the Sale of Foods and Drugs Act is so limited in its aim and scope as to practically prevent the analyst from testing anything but the common articles of food, such as bread and milk, unless they are sold under some recognised name. Let him once travel outside these lines, and a whole host of objections are raised. What is really wanted is more stringent legislation, similar in character to that at present in operation in the United States and Paris.

In the French Section were shown the monthly reports of the Municipal Laboratory, showing the complete and thorough manner in which the food supply of that city is protected. Why cannot something of the same sort be done in London? What is wanted is a measure defining what is and what is not adulteration, and prohibiting the use of articles which are frequently employed at the present time, and the sale of which while benefiting one class seriously injures another, by substituting an inferior article for one of better quality.

Considerable good, it may be hoped, was done by the Health Exhibition by the exhibition of these so-called substitutes. The prominent display of this instructural series in a National Exhibition has, we trust, done something towards putting a stop to a trade which, while it enriches the unscrupulous trader, places the honest manufacturer in an awkward position.

How far it has fulfilled this intention is of course not yet apparent, but I shall certainly feel it a part of my duty in another capacity, as Chairman of the Parliamentary Bills Committee of the British Medical Association, to endeavour to keep the attention of our legislators to this important subject. It may be hoped

that, when the political horizon is sufficiently cleared to enable Parliament to devote some time to interests of almost as important, if less strictly party character, as those which are now occupying their attention, that it may be possible to secure for the people of England, or at least for the people of this metropolis as an example to other great towns, some of those better securities against the adulteration of food which this country was the first to set the example of creating by legislative action, but as to which it has, at the present moment, fallen behind some of those countries which followed us, such as France, Belgium, and America. It is within my knowledge, and in fact within my personal experience, that in all those countries our English legislation was originally the model which they set before them. In fact, in the case of several of these countries, I have had the opportunity of receiving the gentlemen who had been sent over by their various Governments, and of furnishing them in several instances with the opportunities of study and materials of which the respective Governments have availed themselves to create model laws respecting adulteration; I would refer here especially to the German code.

It is hardly to our credit that we have allowed ourselves to be distanced in a race in which we had so considerable a start, and in which the sole goal is the public benefit, and the maintenance of the public health. These are questions largely affecting the health of the whole nation, and especially affecting the welfare of the poor, who suffer most by the substitution of worthless, inferior, or adulterated articles in the fabrication of apparently cheap, but often very dear because worthless, articles of food.

EXECUTIVE STAFF.

I would ask your leave now to put before you a few figures which have been furnished to me by the heads of the departments of the Exhibition, to whom I applied for information, which should, in familiar way, illustrate the enormous amount of work which they carried out in their departments, and which alone enabled this undertaking to be organised with such singular success, on so large a scale, and in such a short space of time, and to be carried out without, so far as I know, one single hitch of any importance through the whole of the time it was open to the millions who visited it. Mr. Edward Cunliffe-Owen, the able and energetic secretary, tells me the work

of the secretarial department commenced with the very first meeting of the Executive Council. The secretary attended personally every meeting of the Council, kept the record of their proceedings, and took the necessary action on their decisions. He also superintended, in conjunction with Mr. Truman Wood, the formation and the meetings of the various sub-committees which were called together to assist the Council in their labours. He issued circular letters to foreign powers, to their representatives in this country, to the mayors and local corporations in England, and to many others, calling attention to the Exhibition, and superintended the preparation and issue of the prospectus at home and abroad. It has been the duty, too, of the secretarial department to see the numerous visitors who called, and to explain to them any questions in connection with the Exhibition, and later—when the various sections of the general superintendent's department were formed—to direct them to those who could give more detailed information.

In addition, a very large amount of correspondence of a very miscellaneous character has been maintained. No fewer than 20,000 letters have been received by the secretary from the 3rd of October, 1883, to the 20th of November, 1884; and about the same number—exclusive of circulars—have been despatched by him.

The secretary controlled the issue of exhibitors and attendants' passes, the advertising of the Exhibition, the daily programme of the arrangements of the Exhibition; and was the means by which the decisions of the Executive Council were made known to the various branches of the executive staff, and to all whom they concerned.

As affording some idea of the amount of work connected with the general superintendence department, I am informed by Mr. Hake, the courteous and indefatigable general superintendent, that 5,000 cases, registered and numbered, were received and deposited at the various stands, and some 7,000 exhibits, in the way of appliances and materials, were passed into the buildings, independent of 5,000 conveyed by hand previous to the opening. In the first three days of the closing of the Exhibition, over 1,000 vans passed in and out of the Exhibition.

JURY DEPARTMENT.

The manner in which the jury work was to be conducted was a matter of long and care-

ful consideration by the Executive Council. Eventually, on the recommendation of the Council, H.R.H. the President appointed from amongst its members a commission of five, who might take special charge of the work. Mr. H. Trueman Wood, the Secretary of this Society, and Mr. Gilbert Redgrave, were appointed joint Secretaries of the Commission. The Commission held its first meeting on March 28th, and in accordance with the wish of the President, prepared a scheme by which the exhibitors themselves should have the opportunity of nominating the jurors. In answer to an application to this effect addressed to the English exhibitors, nearly all of them sent in the names of persons whom they considered specially qualified to act as jurors in the classes with which they were concerned. From these lists a selection was made, and it may be said that, in every case in which any individual received the suffrage of as many as four exhibitors, he was appointed if willing to serve. It often happened that there was not sufficient unanimity amongst the exhibitors to guide the Commission in their selection, and they were, therefore, obliged to rely on their own judgment in making the remaining appointments. It was felt that the appointment of foreign jurors had better be left to the Commissions appointed by the Governments of countries taking part in the Exhibition. The commissioners were informed of the means which had been taken to elicit the opinions of English exhibitors, and it was left to them to act as they thought fit as regards the appointment of representatives of their own countries. Jurors were consequently appointed by the Commissioners representing Austria-Hungary, Belgium, France, Italy, Russia, and the United States. Eventually 28 juries were appointed, amongst whom the 57 classes of the Exhibition were apportioned. The formal inauguration of the jury work took place on June 17, when a meeting, at which H.R.H. the Prince of Wales presided, was held in the Albert-hall. The actual work commenced immediately after this, chairmen of the juries being appointed by the President, and vice-chairmen and reporters by the juries themselves. Their meetings were carried on with very little intermission until the middle of August. By that time most of the work was completed, though that of some of the juries was not finished until shortly before the close of the Exhibition itself. It would be difficult to speak too highly of the way in which the jurors discharged their unpaid duties, and especially of the way in which

those gentleman who consented to act as reporters to the various juries devoted valuable time and attention to the work. On the whole, there seems every reason to believe that the very difficult and laborious work of distributing the awards has been as judiciously performed as could possibly be hoped. The work is naturally one of great difficulty and considerable delicacy, and it is obvious that, speaking generally, only those exhibitors are likely to be satisfied who receive the highest awards. Under these circumstances it is a matter for congratulation, not only to the Jury Commission, but to the Executive of the Exhibition, that so little fault has been found with the decisions of the juries, although some complaints, and no doubt some errors, are inevitable. Let us hope that they have been reduced to their absolute minimum. To that end great efforts were made. It may be useful to put on record the fact that, after some consideration, it was determined that there should be five classes of awards:—Diplomas of honour, gold, silver, and bronze medals, and special certificates of thanks. In addition to these there were special prizes offered by the Society of Arts, with regard to which the juries were requested to make recommendations. The total number of awards made exceeds 1830, of which about 200 are diplomas of honour, 270 gold medals, 580 silver medals, 670 bronze medals, and 100 special letters of thanks. These awards were made quite independently of the Executive Council as a body, and by the juries and commissioners appointed by the President. The total number of exhibitors exceeded 3,000. In addition to the personal examination made by the juries of all exhibits—and it is worth mention that not a single complaint has been received from any exhibitor of his goods not having been inspected—a considerable number of tests and analyses were made by the juries or under their directions. In the case of the electric lighting jury, it was considered wise to institute tests for incandescent lamps which would extend over a considerable space of time, and, therefore, any awards to be based on these must of necessity be postponed. Special arrangements have been made with the executive of next year's Exhibition of Inventions, by which they have undertaken to carry on these tests, and to make awards upon them. A great number of analyses were made of foods, soaps, paints, varnishes, &c.; and many of the materials employed for house decoration, such as wall papers, hangings, carpets, &c., were chemically examined, for the purpose

of ascertaining whether they contained ingredients likely to be harmful to health.

SMOKE ABATEMENT AND TESTING OF HEATING APPARATUS.

The testing of exhibits in Classes 24 and 25—Heating and Ventilating—were carried out on a considerable scale. Some 120 kitcheners, some burning solid fuel, and some gas, were tested. A large house was rented for conducting these trials, under conditions approximating to those which would be found in the actual use of the apparatus by the public, and a large number of tests of cooking joints, &c., in the kitcheners, &c., were made. The importance and necessity of exact testing, initiated by the Smoke Abatement Committee of 1881, and since carried on in a systematic manner by the National Smoke Abatement Institution, were fully recognised by the Executive Council of the Health Exhibition. The series of testings were conducted by the acting engineer to the Smoke Abatement Institution, Mr. D. K. Clark, and the jury of the Exhibition dealing with these exhibits included Professor W. Chandler Roberts, Mr. Robert Harris, president of the Gas Institute, and other members of the Smoke Abatement Institution whose special knowledge peculiarly fitted them for the work.

The practical advantages of such testings have been manifested in the great interest taken by exhibitors in the work, their general desire to submit their manufactures for testing, and the evidently accelerated course of improvement in design since the Smoke Abatement Committee first introduced the system of tests, and advanced knowledge derived from the results of those tests.

At the Health Exhibition, these beneficial influences were clearly traceable in the adoption of good ideas embodied in apparatus shown at the Smoke Abatement Exhibition, in 1881, and brought into notice by the testing treatments adopted there, as well as in the rejection of plausible but impracticable methods of heating and ventilation which found place in the earlier exhibition. The detailed report of the tests of the apparatus shown at the Health Exhibition I trust will be published, for it will form a valuable addition to a continuous and advancing series of tests. The importance of this branch of my subject can hardly be exaggerated. We can follow, in the light of the knowledge derived from the result of the later tests, a regular and most encouraging course of improvements. For example, some

of the exhibits shown at the Crystal Palace Exhibition last year, in the class of gas-cooking and heating stoves, were proved to have a greater efficiency, by about 20 per cent., than those shown at the Smoke Abatement Exhibition in 1881; while at the Health Exhibition the efficiency proved by the tests was fully 25 per cent. greater than at the original Smoke Abatement Exhibition. Besides this increased efficiency, or improvement, to be measured by lower consumption of gas for equal work done, there has been an improvement hardly less important in numerous points of detail, affecting both the durability of the apparatus, and the facility with which it can be cleaned. These latter improvements, added to the lessened price of gas, and the reduced consumption of it in the newer forms of stove, cannot fail to tend towards the increased use of these cleanly conveniences and smokeless heating appliances for domestic purposes.

The testings at the Health Exhibition brought out the merits of a number of kitcheners and stoves very well adapted for using coke and "slack," or small coal, as well as improved patterns for using the ordinary lump coal, with lessened production of smoke. In regard to the advance made in smoke prevention from domestic fires, I may mention, on the authority of the testing engineer, that the highest average smoke shade proved by the tests of 1882 was 4.18 from kitcheners; and in the test at the Health Exhibition, the highest average was only 2.4; and from open grates, the average density of the smoke was 3.0 in 1882, and at the Health Exhibition it was only 1.75. The importance of facilitating, by means of improved apparatus, the use of coke and the cheaper fuels now generally wasted is obvious, and I think I may fairly claim that this section of the Exhibition achieved a highly useful and successful result. In the bakeries department no less than five distinct systems of heating bakers' ovens, practically without the production of any smoke whatever, were shown—and not only shown, but were proved, by an extended course of actual working, to be more or less well suited to the requirements of the trade. Varieties of machines for making dough by cleanly and expeditious methods were successfully worked throughout the period of the Exhibition; and it is but reasonable to assume that the exhibition of these machines, shown daily in satisfactory working, must have a great future influence in putting a stop to the laborious and filthy process of making dough by manual labour.

EDUCATION SECTION.

The Education Section of the International Health Exhibition was opened on June 25th, by his Royal Highness the Prince of Wales, on the occasion of the formal opening of the Central Institution of the City and Guilds of London Institute.

It had been originally intended to arrange all the educational exhibits in the rooms kindly lent by the Committee of the City and Guilds Institute, but the space applied for was so greatly in excess of that available, that it was necessary to divide the exhibits. School furniture and apparatus and appliances for instruction were placed in the gallery of the Royal Albert Hall. Exhibits relating to the heating and ventilating of schools, school sanatoria, &c., and gymnasia, were placed in a separate court; and the rooms in the City and Guilds Institute were reserved for exhibits by institutes and societies, for the exhibit of the French Ministry of Public Instruction, and for objects connected with technical education.

Infant teaching was admirably represented by the Kindergarten established by the British and Foreign School Society, under the direction of Mr. Browne and Fräulein Heerwart. Weekly demonstrations were given to classes by experienced teachers, and the Kindergarten was so arranged that the visitors could easily see and hear the teachers and children. As soon as these demonstrations became known, great numbers of people visited them, and there can be no doubt that the Kindergarten system has attracted considerable attention, and received a decided stimulus, in consequence of the enterprise of the British and Foreign School Society.

On the occasion of the final demonstration, which took place in the west theatre of the Royal Albert Hall, the room in the Institute not being large enough, a class of about sixty School Board children received instruction, and a conference of Kindergarten teachers held.

Elementary instruction in England was well represented by the School Boards of London, Edinburgh, Glasgow, Birmingham, and Sheffield.

The London School Board showed a very complete collection of furniture, appliances, and results of instruction. Most attractive were the illustrations of the teaching of cookery given daily in the "Centre" established by the Board in the Exhibition. Here, under the superintendence of Miss Burrows and Miss Worsnop, classes of children from Board schools received practical instruction in elementary cookery.

The Birmingham School Board exhibit contained, amongst other objects of interest, sets of apparatus illustrative of the itinerant system of science instruction which has been elaborated for the Board by Mr. W. J. Harrison. This system was originally suggested by Colonel Donnelly, to obviate the difficulty of expense on account of apparatus connected with the teaching of elementary science in Board schools.

The Sheffield School Board sent drawings and specimens of work in wood and iron from their Central School, which has been established to provide elementary technical instruction. The action of the Sheffield School Board in this direction cannot but be watched with extreme interest, by all concerned with the improvement of mechanics and engineers in the theoretical knowledge connected with their trades.

The French Ministry of Public Instruction exhibited a very complete series of approved apparatus, appliances, and examples of results of instruction in infant schools, primary schools, technical schools, and training colleges.

Many of the specimens of technical work in wood and iron, from the primary and higher primary schools, were remarkably good. The drawings exhibited, as examples done by candidates for the certificate to teach drawing, were of great excellence.

Most remarkable were the sets of apparatus and objects for teaching zoology, and physiology, chemistry and physics, as granted to the training colleges in France by the Government.

The Brothers of the Christian Schools exhibited results of teaching from schools in France, Belgium, the United States, Canada, &c. A representative of the society was always present in the room, to give visitors the fullest information regarding the wonderfully complete system of elementary education organised by the Brothers. Especially noteworthy were the appliances for teaching geography, the hypsometrical charts of the Brother Alexis, and the remarkable series of drawing copies and models used in their elementary and technical schools.

The technical work from some of the more important schools, such as St. Nicholas, in Paris, were of a very advanced description.

Most noteworthy also were the numerous school museums of a local character, contributed by various schools, consisting of natural objects, and of specimens illustrative of various arts and manufactures,

A number of very important exhibits were sent by technical schools in France, Germany, Austria, and Switzerland. The Kwestgewerbe Schule of Karlsruhe sent a remarkably fine series of drawings, decorative paintings, specimens from the wax-modelling and wood-carving classes, models in plaster, &c.

The Wood-carving School of Furtwangen also sent some fine specimens of students' work. Würtemberg sent collections from the Building School, Workmen's School, and from the Schools for Needlework and Embroidery, at Stuttgart and Reutlingen. The Austrian schools sent specimens of work from the courses for cabinetmakers and joiners, basket weavers, &c. From the Industrial Art Schools at Geneva came specimens of work in wood, iron, bronze and silver.

Amongst exhibits of technical work from schools in Great Britain must be mentioned those from the Allan Glen Institute, Glasgow; from the Technical School of University College, Nottingham; the Royal Albert Hall School of Wood Carving; the Manchester Technical School, and the Finsbury Technical College. These exhibits, together with some few others, show that technical teaching is at last beginning to receive some of the attention which it has so long needed in England.

The Belgian Government arranged a very extensive series of objects illustrative of the results of their new educational system. Infant Schools and Kinder-garten, Primary Schools, Technical Schools, and Training Colleges were fully represented. The methods of instruction in drawing were especially noteworthy for the results obtained. It is greatly to be hoped that the clerical reaction in Belgium may not lead to any material alteration in the most complete scheme of State-directed education which has yet been put forward.

Amongst special branches of education, which have been illustrated in this Exhibition, must be mentioned the instruction of the deaf and of the blind. Daily demonstrations of the oral system were given in the room arranged by the Ealing Society for the purpose by that Institution, by the Oral Association in Fitzroy-square, and by the Jews' Deaf and Dumb Home.

The lady principal of the Ealing College was constantly in attendance to explain the methods of teaching, and the afternoon demonstrations attracted a very large number of visitors. There can be but little doubt that the introduction of the oral system will be materially promoted by the widespread interest and admiration excited on all occasions in the

very numerous body of persons who took the opportunity offered of seeing the process of teaching.

The teaching of the blind was illustrated by exhibits from the National Institution in Paris, the Naples Institution, the British and Foreign Blind Association, the York School, and others. Dr. Armitage, of the British and Foreign Association, gave occasional demonstrations, and a blind attendant showed the improved method of writing by the Braille system daily. A Kinder-garten class for blind children was held on one occasion by the British and Foreign School Society, and an admirable exhibition of drill and gymnastics was given in the arena of the Albert Hall, by the students of the Royal Normal College of Music for the Blind at Norwood.

Physical education was by no means neglected. In the Swedish gymnasium, installed by Mr. Thomas Nordenfeldt, Miss Bergmann and Captain Haasum gave demonstrations of Ling's system, with classes of boys and girls respectively, belonging to the schools of the School Board for London.

The boys of the Royal Hospital School at Greenwich, and of the Royal Military Asylum, Chelsea, gave several displays of their drill, extension exercises, and gymnastics.

The Anglo-German system of physical education was illustrated on a number of occasions by the German Gymnastic Society, under Herr von Schweizer; and by the Polytechnic Young Men's Christian Institution, under Colour-Sergeant Barber, in the arena of the Royal Albert Hall.

These displays attracted immense audiences, and there is already reason to believe that they have been the means of drawing the attention of many people to the desirability of physical training.

Before leaving this subject, the extraordinarily beautiful expositions of physical education for girls, given by Miss Chreiman, must be given. The gracefulness imparted to the pupils by the course of training devised by Miss Chreiman, was admitted by all who saw the demonstrations.

Undoubtedly the most important feature in connection with the Educational Section of the Exhibition, was the International Conference on Education, which took place in the rooms of the City and Guilds Institute, during the week commencing August 4th. The necessary arrangements were made and the programme drawn up by a Committee consisting of Lord Reay (Chairman); the Ven. Archdeacon

Emery; the Hon. E. Lyulph Stanley, M.P.; the Rev. T. Graham, D.D.; the Rev. T. W. Sharpe; the Rev. J. H. Rigg, D.D.; Mr. Philip Magnus; Mr. J. G. Fitch; Mr. B. St. John Ackers; and Mr. F. Storr, with Mr. R. Cowper (Secretary). Delegates were present from the following countries:—Austria-Hungary, Belgium, Brazil, Denmark, France, Germany (Baden and Saxe-Weimar), Italy, Japan, Netherlands, Norway, Russia, Spain, Switzerland, and the United States of America. The Conference met on August 4th, at 11 a.m., when Lord Carlingford presided, and the introductory address was delivered by Lord Reay.

LITERATURE OF THE EXHIBITION.

The literature of the Health Exhibition, which was under the superintendence of Mr. Trendell, is grouped under four heads, viz. :—

Health in the Dwelling.

Health in Diet.

Health in Relation to Civic Life.

General Hygiene.

Three volumes being devoted to each of these sections, *i.e.*, a volume of handbooks, another of the reports of conferences bearing on that subject, the third being reports of lectures cognate to the section.

The handbooks, 28 in number, include amongst their authors such well known names as Sir Henry Acland, the head master of Eton, Sir Francis Bolton, Dr. Gamgee, Captain Shaw, and Dr. Duclaux, of Paris, Mrs. Gladstone kindly manifesting her interest in the Exhibition by writing a work on "Healthy Bedrooms and Nurseries."

The reports of the conferences, 14 in number, embrace an account of the proceedings of such important bodies as the Medical Society of London, National Health Society, Society of Medical Officers of Health, Sanitary Institute of Great Britain, and Parkes Museum of Hygiene, while among the non-medical societies appear the Society of Arts, the Social Science Association, the Central Chamber of Agriculture, and the Royal Meteorological Society.

Thirty-six lectures were delivered during the term of the Exhibition, mainly on subjects cognate to the handbooks, but a few of a special nature were admitted, such as "Anglo-Saxon Dress and Houses," "Physical Exercises for Girls," "Dairy Management," &c. In addition to these there are four special volumes forming the reports of the very important Educational Conferences, organised

with such signal success by Lord Reay, to which I have just referred. Besides the volumes already mentioned—sixteen in number—there will be published four others, containing the general and special catalogues of the Exhibition, the jury awards, some very important papers setting forth the state of health of China, and giving interesting information as to the position of education in Chinese social and political life, which papers have been deemed worthy of a special place owing to light they throw on matters not easily investigated, and hitherto but little known in this country. The final or twentieth volume will contain the official report, statistical tables, and miscellaneous papers of general interest.

Let me now turn to one or two features of the Exhibition in which I feel a profound interest, which I trust you may share with me, and to which I look, and I hope that you will look, as promising to afford the most enduring and fruitful sequels.

Those features of the Exhibition which interested me most personally, partly, perhaps, because I had the honour of suggesting them, but also because they departed in some important respects from the ordinary routine of previous exhibitions, and because, I venture to think, they had a really pregnant and scientific value—were the sanitary and insanitary houses, the physiological laboratories, the meteorological pavilion, and library.

THE LIBRARY.

The library sub-committee report with great satisfaction that the library has proved an unqualified success, and that it has attracted not only a large number of readers, but a considerable proportion of serious students.

Although no purchases of books have been made, upwards of 5,000 works are now included in the collection, of which over 3,000 relate to health subjects. The great majority are free gifts, a small proportion are on loan. They express a strong hope that a collection of books so useful as the nucleus for the formation of a special library will not be dispersed, but that the Executive Council will devise means to maintain the library on a permanent footing, as part of a memorial of this useful and successful national undertaking.

The library was altogether a novel feature in any exhibition of the kind, and its value was attested by the considerable number of serious students who availed themselves of its extensive resources, many of them being University students, who used this unwonted opportunity

in preparing for examinations. The advantages to be derived from retaining the library as a permanent institution would be great. I put before you a copy of the catalogue, made entirely by Mr. Carl Thimm. This catalogue is in itself a publication of no small interest, being the most complete catalogue of sanitary literature with which I am acquainted (although, of course, it cannot be said to be complete in even an approximate sense, but must only be regarded as a very valuable nucleus for a larger library), in which the hygienic literature of foreign nations, and especially their official hygienic literature, is very largely and well represented.

THE SANITARY AND INSANITARY HOUSES:
AUTHOR'S PROPOSALS FOR FURTHER LEGISLATION CONCERNING HOUSE DRAINAGE AND PLUMBING.

Of the sanitary and insanitary houses a special handbook has been published, which will be preserved among the literature of the Exhibition, and which constitutes a small epitome of the ordinary defects of existing houses, and the simple means by which such defects may in future be avoided. I shall not enter into any description of these houses, for they are already well known to most of you, and may, I yet hope, be further studied on some future occasion. But I wish to draw your attention to the very important conferences on the sanitary arrangement of houses which were held by the Institute of British Architects in connection with this part of the Exhibition, and especially to that held in the last days of the Exhibition by the Guild of Plumbers, under the chairmanship of the Master, Mr. Shaw. This I call your attention to because there is good reason to hope that out of this will spring an organisation, and I trust a legislation, which will, perhaps, do more towards the preservation of health and the saving of life than most of the much more pretentious forms of legislation which we must contemplate in the near future. The Exhibition will, in virtue of the organisation likely to follow from this conference, become the means of drawing together all those scattered forces which have for some time tended in the direction of a great improved regulation of the sanitary condition of our houses: a force, however, which, up to that moment, there seemed but little hope of being able so early and so practically to organise. I feel a peculiar interest in this subject, for I have now for several years, as chairman of the National

Health Society, and in connection with the sanitary section of the British Medical Association, occupied myself with collecting the facts and figures which demonstrate the urgent necessity of improved legislation for the safeguarding of the sanitary construction of our houses, and the improved education and registration of those builders and plumbers to whom we entrust that construction. I read on this occasion at the opening of the congress a paper which I had prepared three years before, and which, in fact, I have in various forms presented to several professional and lay bodies, with the view of forming and gauging public opinion on the subject. I shall venture to put before you here now only the conclusions which I laid before this conference, which practically and in principle received their approval, and which will thus, I hope, have a earlier chance of finding their way into the statute book. They have the object of strengthening of our statute law as to drainage and plumbing. I desire to enlist the aid of the Society of Arts in bringing into legal operation, as one result of the International Exhibition, the proposals which will be found in the report of the conference, of substituting sanitary for insanitary houses.

First as regards drainage itself:—

1. Rural authorities should have the same powers as are now possessed by urban authorities. In the suburbs of towns, just outside the municipal boundaries, thousands of houses are springing up without any sanitary supervision whatever. The rural authority is, perhaps, unaware of the evil, or is, at any rate, careless about it, until the houses are erected; and their opportunity of making bye-laws which can control such houses is then lost.

2. It would be well that the requirements of the Model Bye-Laws as to New Buildings issued by the Local Government Board should be incorporated in a Building Act which should be forthwith passed, and be of general application throughout the country.

3. The plumbing and drainage of all buildings, public and private, should be executed in accordance with plans and specifications previously approved in writing by the local authority.

4. No drainage-work should be allowed to be covered or concealed in any way, until it had been examined and passed by the surveyor.

4A. The efficiency of all drains should be tested by the peppermint or some other test before they are passed; and it should be a rule that, wherever possible, drain-pipes should

be kept from view only by boarding which can be readily removed.

5. No new house should be allowed to be inhabited until it had been passed and certified by the surveyor, and a plan of the system of drainage should be appended in every case to the lease or other document for the letting of the house.

As regards the plumbers, I suggest that—

6. The names and addresses of all plumbers should be registered by the local authority, and no plumber should be able to carry on his trade until he had been so registered, and had received a license from the local authority.

7. Before the license is granted to him the plumber should attend personally at the office of the local authority, for examination as to his qualification as a plumber.

8. Such licenses should be renewed from year to year, and their continuance should depend upon the good behaviour of, and the return of the work done by, the licensee.

9. The names of all licensed plumbers should be publicly advertised once a year by the local authority.

The result of this conference will live. Before long, I think we may promise ourselves, we shall see, as one result of this Exhibition, an active movement set on foot, by which we shall henceforth be enabled to train skilled and educated workmen, and to ascertain by suitable tests their efficiency, and by which we shall be enabled to protect our artisans and ourselves from occupying houses which have been built with a total disregard or flagrant defiance of the first principles of sanitary construction, and of the conditions which we all know to be primarily essential to healthy occupation.

THE HEALTH LABORATORIES.

I pass to the laboratories. It did not at first, I think, appear evident to some of the members of our council how close was the connection between the work to be carried on in these laboratories and the public health. Happily, however, that feeling soon gave way to one of acquiescence in the proposition which I made for the establishment of these laboratories, and, since, a closer examination of the subject has, I think, convinced everyone that it is to establishments of research and of study, such as those over which Mr. Watson Cheyne and Professor Corfield, presided, that we must look for the most solid foundations for future progress, in solving the highest problems connected with the preservation of health: and that no part of the Exhibition fulfilled a higher

purpose, and to none can we look with more assured hope in the future, than to these departments of the Exhibition. A description of the laboratories appears in the official catalogue, and I shall not occupy your time with any description of them.

At the Hygienic Laboratory, in its chemical and physical departments, the public were not merely given the opportunity of seeing hygienic analyses of various kinds going on, and of having them explained to them either by Professor Corfield or his assistants, individually or in the form of popular demonstrations—of which a considerable number were given, chiefly by the senior assistant, Mr. C. E. Cassall, during the time the Exhibition was open—but they also had the opportunity of seeing the ordinary working of such a laboratory, from the fact that Professor Corfield was able to utilise this laboratory for his students. A class of about forty teachers, selected by the Science and Art Department from schools in all parts of the country, attended a course of lectures given by him at the Normal School of Science, and at the same time worked in batches in the hygienic laboratory at the Health Exhibition, and thus the public were enabled to form an idea of what such a laboratory is in full working order; and, indeed, during the whole time that the Exhibition was open after the above-mentioned class had dispersed, there were pupils who worked in the laboratory.

In a complete hygienic laboratory there should be a separate part set aside for physical experiments relating to hygienic appliances; but in this laboratory there was barely space for the chemical work to be carried on, and even the microscopical work could only be prosecuted to a limited extent, inasmuch that the class of teachers went through their course of microscopy relating to hygiene in the physical laboratory at the Normal School, and the absence of physical appliances was replaced, as far as it could be, by demonstrations given by Professor Corfield at the sanitary and insanitary houses.

As regards the biological laboratory, it is sufficient for my purpose to-night to remind you that in it, Mr. Cheyne, the worthy pupil of Sir Joseph Lister, who acted as chairman of the laboratory sub-committee, showed by practical working, and by collections such as had never before been seen in this country with the same completeness, the refined methods of research and of teaching by which we are enabled to study the life, history, and the habits,

the development, and the means of arresting the development, of those minute organisms which modern science has shown to be prime factors in the causation of a great proportion of the most fatal diseases which afflict our flocks and herds, which decimate mankind, and which attack those plants and animals which constitute the staple of our food supplies. Mr. Cheyne's demonstrations were eagerly followed by health students from all parts of the kingdom. A certain number of tables were set apart for study and research, and these were fully occupied from the first to the last days that the Exhibition was open. In Dr. Corfield's laboratory was collected the apparatus for that kind of instruction in the chemical and physical examination of soil, air, water, food, clothing, and materials of house construction, which are essential elements in the education of that great army of medical officers of health who are appointed now under existing Act of Parliament to watch over the health interest of the community. It is very well known, however, that a large majority of those gentlemen have not this necessary instruction, and that at the present moment there does not exist in this country any adequate means for giving such instruction. There are in England 1,102 medical officers of health, and 996 inspectors of nuisances, all of whom are expected to get their information, and to acquire the technical knowledge of which they stand daily in need, as best they can; and it is well known that a large proportion of them are very imperfectly equipped with the necessary knowledge, and, indeed, can hardly be said to possess even the rudiments of systematic technical education in subjects in which they are presumed to be experts on, which they are called upon to decide in matters largely affecting the pockets of the community, and intimately concerning its health. In order to illustrate the importance of the establishment in this country on a permanent footing of such laboratories as those which are shown in temporary working at the Exhibition, I shall ask leave now to refer you to an exhibit which was made in the French Court, illustrating the work done in a similar laboratory by M. Pasteur to that of which I am now advocating the permanent establishment, as the best possible sequel of this great Exhibition.

M. Pasteur is the scientific director of the Ecole Normale Supérieure in Paris, a school especially designed to supply professors in literature and science to the *lycées* or higher

schools of France. He is not, however, called upon to undertake teaching, but is expected to devote all his time to his researches. In a word, in consideration of the considerable national services which he has rendered, an exceptional position has been accorded to him. He receives a professorial salary of £400 a year. M. Pasteur is also the head of l'Ecole des Hautes Etudes, of which Mr. Chamberlain is the sub-director. In this laboratory he receives some pupils. He possesses further a laboratory at the Ecole Normale, where M. Roux is his coadjutor, and where are admitted some students, who are generally persons already known for their studies. He has entire freedom of the choice of students of the laboratory Ecole des Hautes Etudes, as well as those of persons who work in his private laboratory at the Ecole Normale. About £800 a year are allowed for this laboratory by the Minister of Public Instruction and for the last few years, 30,000 francs from the Minister of Commerce and Agriculture. These grants are renewed yearly.

The principal researches of M. Pasteur have related to:—

1. *Wine*, in which he demonstrated that in order to avoid the transformation of alcohol into acid, it is necessary to destroy the germs remaining in wines which are poor in alcohol, by heating them up to 55°-60° Centigrade. He has also studied the action of oxygen and light on wine, and has demonstrated that it is to this action, *i.e.*, to the oxidation of the materials of wine, that we are to attribute the development of the bouquet of wine, *i.e.*, the flavour which it acquires with age. In order that this may yield a product appreciated by amateurs, it is necessary that it should proceed slowly. He has further demonstrated that the ferment of wine exists on the surface of the grape when it has ripened. He has demonstrated the useful and precise indications which the areometer furnishes, in order to appreciate during fermentation the state of the *mout* of the grape.

2. *Beer*.—After having demonstrated that brewers employ, generally, a ferment containing, among others, injurious germs, M. Pasteur indicates the following means for obtaining a pure ferment. A small quantity of pure yeast is prepared according to the exact rules of the laboratory. This is introduced into a large copper pan, three-quarters filled with the wort of beer, which has been first carried to the boiling point, and then cooled before the introduction of the yeast. This vessel only

communicates with the external air by a long tube of copper, many times bent in such a way as to permit the gases to escape without external germs being able to enter. When the wort has been developed, it is drawn off by a tap placed in the lower part of the apparatus, and which is previously purified with the flame of a spirit lamp. The wort of the beer is put to ferment in a large white-metal vat, resting on a plank, and closed by a movable cover, this movable lid dropping into a groove which is kept full of water. As the wort arrives in a boiling state in this vessel, it destroys any germs which may exist there. When it is cooled, and the cooling may be rapidly aided by the use of external cooling water, the yeast is introduced through an opening in the lid. The aëration of the fluid is obtained by two tubes curved downwards, by one of which carbonic acid escapes, and by the other the air enters, after being previously filtered through a layer of cotton wool rolled round a cylindrical cage on metal wires which cap the extremity by which the air enters. This apparatus, like the foregoing one, reproduces exactly the conditions which are found to be necessary in the laboratory to prevent the introduction of external germs. The aëration by these two tubes is sufficient, for the carbonic oxide being heavier than air, they are placed in such a way as to form a syphon; moreover, during the fermentation, the wort is certainly kept in movement by the ebullition of the gas which escapes, so that the aëration, although less active than in some of the technical apparatus previously in use by brewers, is more than sufficient. By employing this procedure, secondary fermentations are no longer to be feared, and the spoiling of beer by secondary fermentation is almost entirely put an end to.

3. A third and profoundly interesting series of researches, which have had a great influence on agriculture carried on by M. Pasteur, are those relating to *charbon*—the malignant pustule or black quarter of cattle and sheep. M. Pasteur has demonstrated that animals of the ovine and bovine species may be prevented from contracting the disease of *charbon* by inoculating them with attenuated germs, obtained by artificial cultivation of the specific minute organism which is ascertained to exist in the case of *charbon*, and to be the efficient cause of the disease. This attenuated preventative material for inoculation is obtained by the aid of what are known as cultivations of the germs made in special liquids. After the first inoculation with the highly attenuated virus,

Pasteur has shown that the second inoculation may be made with a product of medium virulence, and that the animals thus twice vaccinated were unsusceptible of contracting the disease. Pasteur has further demonstrated that the bacteria of *charbon* is capable of retaining its vitality for several years in the earth, and that, when brought to the surface by earth-worms, it is capable of infecting the animals which eat the grass polluted by its contact, especially if the grasses or plants so eaten be hard, and such as to cause abrasions in the mouth and digestive tube.

4. *Silkworm Disease*.—M. Pasteur, after having assured himself that normally, and in good health, silkworms never contain, at any moment of their life, the bacteria or corpuscles seen for the first time by Guérin Menneville, demonstrated that the eggs of the worms, even when only slightly attacked, contained a great number of these corpuscles or bacteria, which developed in considerable quantities when the animal underwent its metamorphoses, and finally destroyed it; since its droppings polluted the leaves of the mulberry on which the silkworm feeds; and as healthy animals thus devoured them, and contracted the same disease, a single infected silkworm was capable of destroying a whole school of worms, and preventing the subsequent cultures from being developed.

M. Pasteur then laid down the rule that, in order to avoid the silkworm disease, it was necessary to choose with extreme care the animals which were to be employed for breeding. With this view he devised the following procedure. When the female has laid its eggs it is at once destroyed. If a single corpuscle is found in its tissues, when crushed in water, the eggs are immediately burned. In the same way the several eggs of each hatching are carefully examined. If no corpuscles are discovered, the white brood is preserved for culture; if any are found, the whole are immediately destroyed. Since that time the silkworm breeders have followed the rules of M. Pasteur. The implements for the purpose of recognising the diseased worms consist of a microscope, two objectives, one with low power and one with high power, magnifying about 400 times, and a small porcelain mortar for crushing the tissues of the worm or its eggs, some glass slides, and a flask of distilled water. By this application of scientific research to the silkworm industry, the silkworm disease has been almost wholly put an end to. Nearly all the silkworm growers, whether masters or servants,

have learnt, by the aid of a very cheap little handbook, prepared by M. Pasteur, to recognise diseased worms or eggs from healthy eggs or worms, and thus a great industry, which was threatened with extinction, has been saved from the fate which threatened it.

5. *Fowl Cholera*.—After having demonstrated that this affection is caused by a micrococcus, M. Pasteur showed that if this micrococcus is cultivated in the manner which he indicates, and the micro-organism then obtained inoculated in a fowl, the fowls so vaccinated become proof against fowl cholera, even when they are placed in the midst of other infected fowls. These researches have a special and suggestive scientific interest, for he has shown that if you filter through plaster the liquid taken from one of the external foci of the disease in a fowl affected with fowl cholera, the filtered liquid thus inoculated will not give a healthy fowl the specific disease, but render it somnolent and inert for some hours, so that it may be concluded that the micro-organism secretes a material to which must be attributed the lesions which are observed in fowls suffering from fowl cholera.

Some idea may be obtained of the commercial value of the work done by M. Pasteur in his laboratories from the following facts and figures, which I have on good authority:—In three departments of the centre of France, after the silkworm disease had attacked the factories, the product yielded a value of less than one million five hundred thousand francs. Since the regulations laid down by Pasteur have been applied, the average value per annum, calculated on five years, in those departments has risen to more than 22 millions of francs.

As to wine, there was a known loss of wine to the extent of one million seven hundred thousand francs in four departments. Since heating on Pasteur's method has been applied, there has been saved of this loss at least one million five hundred thousand francs; the difference of two hundred thousand francs being alleged to be due to the carelessness or ignorance of small proprietors, who are unwilling to heat their wine. As there are in France about 45 departments that make wine, the saving may thus approximately be estimated. I should add that there are 12 departments that make silk.

In respect to anthrax, the following was the official statement indicating the ravages made by this disease in France and foreign countries, and the reduction or mortality effected by these inoculations:—

	Sheep.	Oxen.	Horses.
1881.			
France	62,050	5,977	142
Foreign countries	12,500	1,254	100
Total	74,550	7,231	242
1882.			
France.....	270,040	35,654	1,825
Foreign countries	36,830	6,169	200
Total	306,870	41,823	2,025
1883.			
France.....	268,205	26,453	371
Other countries	84,825	5,777	975
Total	353,330	32,230	1,346

The average mortality reduced by these inoculations in the proportion of 10 to 1 for sheep, and 15 to 1 for oxen, cows, and horses.*

METEOROLOGICAL LABORATORY.

The corresponding exhibit was that of the meteorological laboratory by M. Miquel, in corresponding which I hope to see a permanent meteorological station established as a sequel to the Exhibition. The work of M. Miquel has been summarised, in the following words by Dr. Vivian Poore—The observatory for Mount-Souris was established, in 1871, by the influence of M. Dumas, who was then president of the Municipal Council of the city of Paris. In 1873, M. Marié Davy was appointed director of the observatory by M. Thiers. The work of the observatory is as follows:—

1. Meteorology proper, and its application to agriculture and hygiene. This department is under the control of M. Leon Descroix.

2. Chemical analysis of the air and rain, under the control of M. Albert Lévy.

3. The microscopic study of the organic matters held in suspension in the air and rain. This is under the control of M. P. Miquel.

In 1876, the municipality decided to have the above meteorological observations, in their relation to hygiene, made in different parts of the city. The chemical analyses and microscopical examinations are made—

* In the last thirty years there has been an increase of life-duration of from 39·9 to 41·9 years, an addition of 5 per cent. human duration of life. The annual economy of life, on the least favourable calculation, during the last five years, has been equal to a saving of 36,000 lives per annum. The money saving on the last five years has been calculated, on good basis, by Capt. Galton, to be in London alone nearly half a million of money per annum.

1. On drinking waters.
2. On the waters infiltrating the soil.
3. On the emanations from the soil and sewers.
4. On the air of different localities estimations are made. A. (air), ozone, carbonic acid, ammonia, organic nitrogen; and similar analyses are made of the soil water, &c. Every year the *Annuaire de Montsouris* is published, a work full of information, and which is now in its 13th volume.

The laboratory of Mr. Cheyne, at the International Health Exhibition, was largely fitted up by the aid of Dr. Koch, and of Dr. Koch's laboratory at Berlin. Mr. Cheyne has furnished me with the following outline:—

Dr Koch's laboratory is subsidised by the Government. It consists of director, library, biological department under Koch and several assistants, and a chemical department. All expenses of investigation are paid. Koch's salary is only £300. Other salaries I do not know. When appointed, Koch first set to work to improve methods of cultivating and studying bacteria, and to devise new methods, and the result has been a precision and simplicity in this sort of work quite beyond all expectation. His further researches have been devoted to the study of the cause of disease in man and how to prevent it. Either by himself, or under his direction, the causes and means of prevention of tuberculosis, consumption, erysipelas, osteomyelitis, and glanders, have been absolutely demonstrated; while a large amount of work has been done in respect to the causation and prevention of typhoid fever, cholera, diphtheria, and other affections. His researches on disinfectants, and the best mode of disinfection, are classical, and are still being carried on. This work is being rapidly extended to other diseases, while important researches are going on relating to water, air, and soil.

The Anthropometric Laboratory at the Health Exhibition was designed by Mr. Galton, to show the feasibility of performing, at a small cost, an extended series of measurements of the human faculties, and of testing the demand that there might at present be for having such measurements made. The ulterior object he had in view was to familiarise the public with the facility and need of periodically recording facts which test the progress of individual growth and development, whether it is proceeding normally or otherwise; and if it should be abnormal, to call attention to the existence of hurtful influences, and to demand inquiry into their nature, and whether they may not be removable. The experience of the laboratory

showed emphatically, first, that about seventeen different measurements of each person, including height, weight, strength, breathing capacity, eyesight, judgment of eye, hearing powers, &c., could be accurately performed at a cost of less than 3d., by means of a well-organized method of work; secondly, it showed that the public greatly valued the opportunity of having themselves measured and appraised in so minute a manner, inasmuch as the door of the laboratory was besieged all day long by a crowd of applicants for admission, far more numerous than could be accommodated in its small area, 36 feet long by 6 feet wide. As it was, measurements were made of between nine and ten thousand persons, yielding data that are now being discussed, and which have considerable statistical value. The methods and appliances used and suggested by the experience of their laboratory have been very recently described by Mr. Galton at the Anthropological Institute, which will, doubtless, appear in due course in this *Journal*. It is therefore not necessary here to go into details. It may be taken as established that there need not be the slightest difficulty in periodically measuring with much completeness and keeping a register of the development of every boy and girl in large schools, at the cost of a very few pence per head per annum, on the supposition that the process was methodically conducted by a paid expert, with the willing and gratuitous assistance of the masters and attendants. The power of a system of periodical measurements and tabulated returns upon the well or ill-being of the growing portion of our race is of unquestionable value, and it would seem that common-sense considerations must ensure its being ultimately called into action. Now that there are signs of much awakening to the importance of such records, a central institution becomes especially desirable, where the best patterns of instruments should be kept, where instruction in their use might be obtained, where the methods of tabulation, and of quickly getting useful results out of the data, might be learnt, and where the fullest information of all kinds on anthropometry would be stored. It must not for a moment be supposed that anthropometry is a simple and thoroughly understood art. On the contrary, it continually grows, new methods being discovered from time to time of measuring faculties that had before escaped measurement. There can be little doubt that the progress of the useful art of knowing oneself all round, and of knowing others accurately, of

reducing what has hitherto been too much a matter of estimate to quantitative measurement, would be very largely aided by the establishment of an anthropometric laboratory in a national hygienic institution.

PROPOSAL FOR APPLICATION OF THE SURPLUS TO ESTABLISHMENT OF HEALTH LABORATORIES.

That which I look forward to, then, as the best possible sequel to this Exhibition, is the establishment of these laboratories, so vastly important to the prevention of disease and the maintenance of our population in health, and of the library on a permanent footing and under suitable direction. The whole subject is one on which I can only venture to express, thus far, my individual opinion, although I have the satisfaction of knowing that the views which I have thus put forward have met with considerable approval among many of my colleagues, to whom I have submitted them *in limine* for future consideration by the Executive Council, who may possibly approve of them, and in that case may feel it their duty to submit them to his Royal Highness the President, with whom will rest the ultimate decision as to the disposal of any parts of the surplus. The rumour that such a project was about to be submitted to the Council, has awakened the liveliest interest and satisfaction amongst the authorities of the leading sanitary associations in this country, and I am glad to know that the authorities of the Parkes Museum, of the Sanitary Institute, of the Social Science Association, of the Society of Medical Officers of Health, and of the National Health Society, have each, on their own individual motion, taken the opportunity of expressing, by resolutions and memorials, their strong sense of the great national value which they consider would attach to the accomplishment of this design. Should this proposition prove acceptable to the authorities, there is no doubt that the opinion of the great body of persons interested in the sanitary progress of this country, thus early expressed by the official representatives of every form of sanitary progress, would declare itself strongly in favour of an institution from which considerable results might be anticipated in the furtherance of health education, and of our knowledge of all that relates to the prevention of disease. It is further hoped that an Institute of Public Health, founded on this basis, might prove a home and centre with which these numerous voluntary organisations

now working for the public health might connect themselves, by some well co-ordinated and accepted plan; that it might be a centre where their members would be able to meet; where libraries, class-rooms, and meeting-rooms might be made to serve a valuable purpose in bringing these various societies into closer relation. There is reason to hope that many of the great scientific associations which now foster the progress of science by grants to individual workers, would heartily welcome the establishment in this country of what it so greatly stands in need—a place of higher education and research in sanitary science, such, as I have already pointed out, as have been recently created in France and Germany. England has been first in sanitation; it is here that have been solved—so far as they have as yet been solved—many of the greatest problems of sanitary science; but we must acknowledge that, during the last decade, each of these countries has made progress in the higher departments of sanitary education and sanitary research, in which we can hardly be said to have held an equal place. This reproach we may now find the means of wiping away, and I earnestly trust that this may prove to be a sequel of the International Health Exhibition, than which no higher memorial could have been hoped for or expected.

THE LESSON OF THE EXHIBITION AS TO OPEN-AIR RECREATION, AND PROPOSAL FOR THE ELECTRIC LIGHTING OF THE PUBLIC PARKS.

Let me conclude by reference to another aspect of the teaching of the Exhibition, less scientific, but yet of peculiar public importance. It was often said by the public scorer—a person from whose judgments and criticisms we have commonly much to learn—when walking through the crowded course of the Exhibition devoted to food, and all that concerns the construction and decoration of the dwelling:—“This is a Health Exhibition—Where is the health?” and the popular answer was, “Outside in the gardens.” That answer also I accept. I think you will agree with me that the practical demonstration which this Exhibition afforded of the eagerness of the English people to resort to healthful means of outdoor amusement was in itself a valuable result, and an important experience. The gardens, illuminated by the electric light and enlivened by music, were undoubtedly a great attraction to the Exhibition, and I would be quite willing to agree with anyone who might say that they

were the greatest attraction. Allow me to add that I look upon this not merely as a means, but itself an end. It is no small thing to have acquired the conviction that our open spaces may be, and should be, much more largely devoted to the open-air recreation of the people than they are at the present moment. I say this now, without any intention of entering upon that large question, but with the specific desire to repeat (for it is only by repeating often that one can gain access to the minds of the majority who are all powerful in such questions) that it appears to me to be no small disgrace to this great metropolis that, in the very centre of its crowded districts, within an arrow's flight of the houses probably of most of us who are here, there lie great open spaces, such as Hyde-park (but what I say refers also to Victoria-park) which at night are dreary desolate areas of darkness, which are unlighted, which are dangerous to cross, which are unused in the evenings for any wholesome or moral purpose, which are often scenes for the display of some of the worst vices incidental to the lowest dregs of the population of the great City. Why should we not learn from the success of the music and the lighting of the gardens of the Health Exhibition, that our great parks should all be lighted by the electric light at night, and that throughout the spring and summer months the military bands should play there, and should make those places, which are now not only useless but scandals to the metropolis, the sites of healthful and innocent recreation? I have inquired from a good source what would be the cost of lighting Hyde-park by the electric light; and I am not speaking without data when I say that I believe that Hyde-park could be adequately lighted with the electric light, so that it might add to the resources of health and enjoyment for the teeming population surrounding it, at an annual expenditure of about £5,000. I do not know what impression this will make upon you. I confess that to me such an expenditure seems trifling in consideration of the sum of human happiness and enjoyment, and, I may add, also of health, which such a devotion of municipal or public money would afford to the people of this city. Nor is it likely that the example once set, it would end here. Our Eastern population have a right to the enjoyment of their parks in the evenings that could be conceded to the West. This lesson also, then, the Exhibition seems to me to teach, and how greatly we might all rejoice if it should ulti-

mately prove, that the lighting by electric light of our public parks, and the introduction of music as a part to enliven and attract the people, and to add to the success of the innocent recreation, the health and the happiness of our working population, should form also one of the possible sequels of this Exhibition.

DISCUSSION.

SIR FREDERICK ABEL, D.C.L., C.B., F.R.S., said that as he had devoted so much of his address last week to the Health Exhibition, he could not venture to detain the meeting with many words now. He was glad to find that the views he then expressed coincided in almost every respect with those expressed in the paper. Mr. Hart had touched on almost every important point connected with the Exhibition, and wherever he had left any blank, he (Sir F. Abel) believed that might be supplied from his own imperfect sketch. He might refer to Mr. Hart's eloquent reference to the future of the electric light in rescuing some of our dark places from their present worse than useless condition, in order to point out that the great achievements of the electric light at the Exhibition had been dealt with in last week's address. There was no doubt that great progress had been shown in this department, and it might be expected that the illumination of public places, as well as of large buildings and small dwellings, would be facilitated thereby. As a member of the Jury Commission, he might be allowed to bear testimony to the great labour bestowed by the members of the jury, many of them most eminent men, on the somewhat thankless work of carefully examining the merits of the various exhibits. Some of the reports, which were necessarily of a more or less confidential character, were most interesting. It was his duty to assist in examining these reports, and in weighing as carefully and judiciously as possible the conclusions arrived at by the jurors; and he could bear hearty testimony to the success of their labours, and to the general justice with which the rewards were meted out by the jurors. With regard to the laboratories, the portion of the Exhibition in which he naturally took the most lively interest, he most heartily supported the views Mr. Hart had expressed regarding the important work there achieved. They had not merely opened the eyes of those of the public who visited them to the importance of the application of science to daily life, but they had also opened the minds of those who had already devoted themselves to such researches, to the importance especially of those particular kinds of research which were provided for in the physiological laboratory. Mr. Hart had given a few very striking instances of the glorious results achieved by M. Pasteur, and might have referred to similar work, equal almost in importance, accomplished by Koch and others; and,

no doubt, on reading the paper, convincing proof would be found, that in every direction connected with our national health and prosperity such laboratories were absolutely essential. Such laboratories had been established abroad, where, in consequence perhaps of individual liberty not being so jealously guarded, it was more easy to do this, but he was perfectly sure that the Health Exhibition would mark a point of departure in this country with respect to the application of scientific research to daily life. If they could succeed in carrying out the scheme on which amongst themselves there was a perfect consensus of opinion, viz., that such financial results as might have accrued from the Exhibition should be devoted to the establishment of institutions of a national character in which these branches of research should be carried on by men able in every respect to conduct them, great good would result. There were such men here, pupils of Pasteur, Koch, Lister, and others, who were only awaiting the opportunity to do what was being done abroad, and he was quite sure that if the opportunity were offered, the results achieved would be equally important.

Mr. WILLIAM BOTLY said he had taken great interest in exhibitions from the very first, having been associated with the Bishop of Salisbury, and Mr. Fawcett, then Mayor of Salisbury, on the local committee formed to assist in getting up the Great Exhibition of 1851; he had also been a guarantor to the Exhibition of 1862, and assisted other members of the Society in aiding in the French Exhibition, and in sending over the English artisans whose reports were so valuable and interesting. He was glad to hear the credit given to the Social Science Association for having taken the lead in Health Exhibitions which was its due, and he saw no reason to doubt that as the first Great Exhibition of 1851 had marked a new era for the manufacturing and trading classes of this country, so this Health Exhibition would produce results of at least equal importance with regard to the national health. Every one must have been struck with the suggestion at the close of the paper, that the open spaces around the metropolis should be utilised as places of public amusement, and he hoped the idea would not be lost sight of.

Mr. E. C. ROBINS spoke in high terms of the paper they had had the pleasure of listening to, which would form a most useful memorial of the Exhibition. Having had to do with some of the arrangements, he must express his gratitude to Mr. Hart for specially mentioning matters in which he had taken a particular interest—for example, sanitary and insanitary houses. He was glad to find that the public took a great deal of interest in these houses, because they afforded familiar illustrations which every one could apply for themselves, and the only thing to be regretted was that they were finished so late in the year. He hoped, amongst the many good things promised as the result of the Exhibition, that they might be left standing, as a permanent proof that the Health

Exhibition really deserved its name. He also hoped that Old London would not be taken away, seeing the great interest which attached to it from an architectural as well as an archaeological point of view. The publications were also of great importance, and as hon. secretary to the Conference of the Royal Institute of British Architects, he was glad to hear the papers and discussions then so highly spoken of, as it would, perhaps, tend to a larger circulation of these reports. They were certainly very voluminous, and some persons might be almost afraid of beginning them; but the whole need not be mastered by every one, and portions might easily be picked out which would be found remarkably interesting. He hoped the results of the Exhibition would be lasting, and that in future the English public and Legislature would not be so backward as they had hitherto been in adopting the measures necessary for the protection of the public health.

Dr. ALFRED CARPENTER said he was not quite sure whether, as a doctor, he ought to be thankful for the Health Exhibition, for he understood from many of his medical brethren that they had not been at all busy lately, though whether the Exhibition and various conferences in connection with it had already begun to show their influence on the health of the people remained to be seen. It might be that the beautiful weather which had helped to make the Exhibition a success, had also had an effect on the health of the public generally; but he was quite sure that the Exhibition had tended to popularise knowledge amongst the people, and to get rid of some of that crass ignorance which was so prevalent, especially among the middle and upper lower classes, as to what was or was not injurious to health. Some of Mr. Hart's observations came home to him quite closely, his reference to the plumbers, for instance; for it happened that many years ago he was instrumental in bringing before the public in his neighbourhood the sanitary defects arising from imperfect plumbers' work, and after pressing this point on the local authority, he had the honour of being publicly burnt in effigy as the reward of his labours in the public interest. However, this had the effect of directing the attention of the authorities still more to the points he had raised; and now he was glad to see that the plumbers themselves recognised the necessity for those regulations which he had advocated ten or twelve years ago. He was quite certain, from his knowledge of the way in which the health of the public had been sacrificed by insufficient plumbing, that the mere fact of plumbers themselves insisting on proper work and education would tend very materially to assist in raising the public health. The crowning portion of the paper, however, was the reference to the important work in connection with the biological and chemical laboratories, and the necessity that those laboratories should be continued, and become a lasting memorial of the Health Exhibition. They would bring about results which

at present they could hardly realise. That these results would be brought about in the future he felt confident. They had only to look at the enormous amount of preventible disease which existed, to be aware that when that was removed there would be a complete alteration; and it was now evident that prevention was becoming much more important than cure, and that was, after all, the foundation on which the Health Exhibition would rest.

The CHAIRMAN then invited the meeting to pass a vote of thanks to Mr. Hart for the interesting paper he had read, and for the able manner in which he had concisely brought forward the principal features of the Exhibition. He gathered from the remarks which had been made that there were certainly some of those features which had received very general approval. The Exhibition differed, in one respect, from any previous one held in this country, inasmuch as instead of confining it to articles which were deserving of merit, and competed for rewards, the Executive Council thought it well, in the interest of health, that the bad as well as the good should be included; and that they should bring prominently before the visitors and the trades concerned the defects which had been found by constant examination to exist in the sanitary arrangements of houses, and the workmanship connected with them. They, therefore, took the somewhat bold step of exhibiting things which were to be condemned as well as those which were to be rewarded. The comparison of such things, whether in the sanitary and insanitary houses, or in the numerous collections of defective plumbing, actual specimens of defective work, not old, but modern work cut out of new houses, and of defective drainage, could not have been without their effect on the minds of the workmen and the builder, as well as to put those who were to occupy the houses on their guard against permitting or overlooking such defects. Another point on which there seemed to be a general concurrence of opinion was that the financial results of the Exhibition, whatever they might be, should, if possible, be consolidated into some one principal object, rather than be frittered away in donations, or distributed to numerous objects, none of which, perhaps, could be by such means effectively established and made permanent. There was no doubt that great benefit to the country, in every part of its great interests, whether in manufactures, in the health of the public, of its flocks and herds, and even in the health of the food-producing plants, would result from these careful and minute examinations which had been carried out in other countries, by the methods which had been shown in operation in the laboratories in the Exhibition. He entertained no

doubt that if such laboratories could be established, English experimentalists and chemists would be found as patient and successful in their researches as Pasteur or any other of the able men who had been referred to. It was by such researches that health must be sought, in the dwelling, in the diet, and in civil life, the three great objects which the Exhibition was intended to promote. This would be, after all, only carrying out the idea long ago promulgated by Sir Francis Bacon, who advocated the reduction of every question to the crucial test of actual experiment.

The vote of thanks having been carried unanimously,

Mr. ERNEST HART, in thanking the meeting for its kind expression of approval, said it had been a source of very great satisfaction to him to find that, in that assembly, as everywhere else where this question of the perpetuation of the Exhibition by the devotion of the surplus to the objects to which he had referred, had been adverted to, had been received with favour. He would only detain the meeting to say one thing more. He had referred especially to the researches of foreign observers, because he felt, in the present state of things in England, it might be invidious to select the work of any particular English investigator for comment. He had referred, therefore, to Pasteur and Koch; but it would not be right to forget the great work done by Englishmen, by Sir Joseph Lister, for instance, whose researches on the question of the multiplication of germs had revolutionised the whole practice of surgery throughout the world. And Mr. Cheyne had himself made a series of observations of most remarkable value as to the prevention of consumption, by following out researches of a similar kind. Again, in the intervals of his great scientific and practical work, Sir Joseph Lister had proved that the whole question of the souring of milk depended on the *bacterium lactis*, and that the butyric ferment was due to another kind of bacteria. The milk industry opened up a great field for investigations of this class; it was found that every variety of cheese was due to the influence of a particular kind of minute vegetable organism, which by its mode of maturation gave to each cheese its particular flavour and quality; so much so that one kind of cheese could be made only in one cellar, and another kind in a cellar perhaps 300 yards off, and in none of the intervening cellars could the same kind be made. The last time M. Pasteur was in England he went to a dairy, and he told him that his greatest desire would be, if he had three years to spare, to spend them in the laboratory of a dairy, working out the relation of germs to the milk and cheese industry.

